

THE ZOOLOGIST

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MIGRATORY AND OTHER ORNITHOLOGICAL NOTES FROM LOWESTOFT.

By F. C. COOK.

THE following observations were made in the neighbourhood of Lowestoft from June, 1913, to June, 1914:—

June 1st.—A Swan was seen flying southwards uttering harsh cries, to which it was keeping time with its wings.

5th.—Swifts were passing southwards almost continuously during the afternoon. A Curlew was seen making southwards, and a Ringed Plover had arrived on the Denes. Large numbers of Swifts were again seen passing southward on the 7th.

8th.—Three Ringed Plovers flying south along the shore.

14th.—I visited the nesting-places of the Terns between Kessingland and Southwold. There about twenty-five to thirty pairs of Lesser Terns nesting, but I could not find the Common Tern actually nesting, although several were seen. At Benacre we flushed a Nightjar off her two eggs, which were laid on the bare sand in the midst of a number of yellow-horned poppies. Several pairs of Ringed Plovers were seen which had evidently got young ones. A Grey Wagtail (*Motacilla melanope*) seen busily feeding at the tide-mark. Nesting in the sand-cliffs were a large number of Sand-Martins; and below, under the nest-holes, we found some dozens of the young birds lying dead in all stages of plumage. Query—Had these young birds perished in the nest and been ejected by their parents, or had they by their own endeavours got to the entrance of the hole and fallen out?

16th.—Several flocks of Starlings were noted going south; each flock contained from ten to thirty birds. A pair of Red-backed Shrikes seen. More Starlings were going south on the 17th.

22nd.—A large number of Curlews were heard over the town at night.

29th.—Cockchafers swarming the hedgerows on the outskirts of the town, upon which a number of Noctule Bats were feeding. There were several Swifts "hawking" in the vicinity, but it is, I should imagine, impossible that they were catching Cockchafers.

July 1st.—Two Wheatears in immature plumage were seen on the shore.

The weather during the early part of the month was very cold and dull, the wind being northerly. The nights were made weird by the cries of numerous waders; Ringed Plovers, Dunlins, and Curlews being heard among others.

Several Goldfinches frequented the coarse thistle-patches on the Denes for a week or so during the month.

16th.—Four Lesser Redpolls were seen on the Denes.

August 4th.—One Grey Wagtail seen at Beccles.

9th.—An immature Cuckoo, a Red-backed Shrike, a Wheatear, and a flock of Common Terns had appeared. There was also a considerable increase in the number of Goldfinches.

13th.—Six Wheatears, a young Red-backed Shrike, a Willow-Wren, and a common Whitethroat had arrived. A large number of Common Terns were also seen.

Three Wheatears and fewer Terns were seen on the 14th.

16th.—By swimming boldly into the harbour, and away up the river, a Guillemot caused some considerable diversion among the visitors.

During the past week or so numbers of Curlews were heard passing over the town at night. On nights when the moon was up, the notes of these waders were heard less frequently and appeared to be from a greater altitude.

17th.—A considerable increase was noted in the number of Stonechats, Wheatears, Common Whitethroats, and Terns. A flock of seven Curlews were observed flying south.

18th.—A very strong north wind. Two Oystercatchers, two



flocks of Ducks, and several Terns and Gulls flying north along the shore. About fifty Common Terns on the beach.

20th.—Two large straggling flocks of Sand-Martins flying south fairly high. An increase was noted in the number of Terns. While feeding peacefully on the tide-mark two Rooks were attacked by a Common Tern, which darted down at them from a height, and eventually drove them off the beach.

21st.—A Land-Rail came to hand, having struck the telegraph wires the night previous.

24th.—An increase in the number of Meadow-Pipits was noted, while a number of Sand-Martins were going south in large flocks.

26th.—A great movement of Sand-Martins was seen, the air seemed at times alive with them, all going south; a few Swallows and House-Martins were also with them. Several Common Whitethroats and two Lesser Whitethroats seen, also two Wheatears and two Willow-Wrens; a few small flocks of Linnets, one flock of Greenfinches, and two Ray's Wagtails were observed going southwards.

27th.—A Pied Flycatcher and a Lesser Whitethroat appeared. A few Sand-Martins were observed going south.

28th.—A considerable number of Wheatears and Meadow-Pipits had arrived; three Common Whitethroats and a Willow-Wren were also seen.

30th.—A decrease was noted in the number of Wheatears, while Meadow-Pipits were observed in about the same numbers. One Pied Flycatcher and a number of Mistle-Thrushes were seen. At night the notes of Redshanks, Ringed Plovers, and Curlews were almost incessantly heard.

September 1st.—An immature female Ferruginous Duck (*Fuligula nyroca*) was shot at Hopton by Mr. Knight.

2nd.—A Pied Flycatcher and a Willow-Wren seen. A Whimbrel was heard passing over the town at night.

3rd.—A number of Wheatears, several Pied Wagtails, four Pied Flycatchers, and a Willow-Wren were noted. Redstarts and Pied Flycatchers were seen also further inland later in the day.

Dr. Ticehurst received a batch of about forty birds from a fishing-smack just in from sea; among them were an Ortolan

Bunting, a Golden Plover, Pied Flycatchers, Willow-Wrens, Whitethroats, Tree-Pipits, and Meadow-Pipits.

4th.—A great increase of Wheatears and Redstarts. A Wryneck, two Whinchats, a Common Whitethroat, a Tree-Pipit, and a Pied Flycatcher had also appeared. Six Kestrels were observed hovering within a few yards of each other; a flock of fourteen Whimbrel seen flying south. Several Sand-Martins, Swallows, and House-Martins seen.

A Honey-Buzzard was taken at sea, and came into the possession of Dr. Ticehurst.

5th.—I had a splendid view of a Bluethroat (*Cyanecula suecica*) that was skulking in the paths of a garden which overlooks the sea, and on one occasion it alighted on a tree within a yard or so of where I was standing. Wheatears, Whinchats, and Swallows were observed in about the same numbers as the 4th, while an increase was noted in Redstarts, Pied Flycatchers, Common Whitethroats, and Lesser Whitethroats. Two Kestrels and a Sparrow-Hawk seen.

6th.—Three Bluethroats were observed on the North Denes; they were exceedingly shy, and were it not for the fact that I was watching closely for this species they undoubtedly would have escaped detection, for practically the only view one can get of them is the flash of the red rump as they disappear round a bend of one of the paths that form a network among the furze covering parts of the Denes, though on one occasion I came upon one so suddenly that it stood facing me for several seconds, being evidently too frightened to move, thereby giving me a most satisfactory view of itself.

A Golden Plover and a Common Sandpiper were brought to me from a fishing-boat, having been taken at sea. A local taxidermist has had nine Kestrels brought in from sea recently; Dr. Ticehurst has also had three.

7th.—Two Bluethroats seen; the number of Pied Flycatchers, Redstarts, and Whitethroats had considerably decreased.

A number of migrants having been observed by our fishermen at sea, I decided to spend a week out with one of the fishing-smacks, but was most unfortunate in not seeing a single migrant during the whole week, the weather having become too fine for them to come on board. A few notes on the fishes, &c., that I

observed have been included with Mr. Patterson's notes (*ante*, p. 17).

15th.—Linnets, Meadow-Pipits, and Starlings were noted in fairly large numbers, while a few flocks of Linnets and Meadow-Pipits were seen to drop in from the north. A Garden-Warbler and a Lesser Whitethroat seen, also several Wheatears. An increase in the number of Blue-Tits and Hedge-Sparrows was noticed. Numbers of Swallows and House-Martins observed.

17th.—A large number of Swallows and Martins and two Pied Wagtails passing southwards. Linnets were observed in great numbers. Several Wheatears, a Willow-Wren, a few Meadow-Pipits, and six Pied Wagtails seen; while Song-Thrushes, Blackbirds, Sky-Larks, and Hedge-Sparrows were observed where previously none had been seen.

18th.—A great decrease noted in the number of Linnets. An increase of Meadow-Pipits, several flocks dropping in from the north. A great mustering of Starlings was observed. About the same number of Wheatears and Pied Wagtails, Swallows, House- and Sand-Martins seen.

19th.—Still more Linnets; Starlings and Pipits appear to be in same numbers as yesterday. I heard a Starling mimic the Curlew's note almost to perfection. A flock of Greenfinches had appeared, while a decrease of Wheatears and Pied Wagtails was noted. A Willow-Wren and a few Swallows and House-Martins seen.

21st.—Several Reed-Buntings had arrived on the Denes, and a small flock was observed going north. A number of Sky-Larks and Linnets had appeared, while several flocks of each were going north, as were also a number of Pied Wagtails. Meadow-Pipits were observed in fair numbers, a few making southwards. Starlings were still common. Two Mistle-Thrushes and two Song-Thrushes moving south together. A few Wheatears, one Willow-Wren, numbers of Swallows and House-Martins seen.

23rd.—Still several Reed-Buntings; a flock was seen to drop in from the north, while on the Denes this species frequents the marram, upon the seed-heads of which several were observed feeding. Great numbers of Linnets and Starlings had arrived, flocks of both species going south, also several flocks of Linnets

going north. A few flocks of Sky-Larks going north, and several flocks of Tree-Sparrows were noted going south. A flock of Great Tits was seen to drop in from the south, and two Coal-Tits had arrived. A Willow-Wren, a few Wheatears, and hundreds of Swallows and House-Martins were seen.

24th.—A great number of Wheatears had arrived, among them were several of the Greenland form. Two Grey Wagtails, a Chiffchaff, and a few Pied Wagtails were seen. The number of Linnets and Meadow-Pipits had decreased; several flocks of Linnets flying southwards. A few Swallows and House-Martins seen.

27th.—Several flocks of Greenfinches, large numbers of Meadow-Pipits, and a few flocks of Linnets moving southwards, a few Linnets were also noted going north. Three Grey Wagtails seen flying south; several Pied Wagtails had arrived. Sky-Larks and Reed-Buntings were dropping in from the north; Goldcrests, Blue Tits, and Great Tits had arrived in fair numbers, and an increase of Mistle-Thrushes, Song-Thrushes and Hedge-Sparrows was also noted. A few Swallows and House-Martins making southwards, one Sparrow-Hawk seen; still large numbers of Wheatears.

28th.—Linnets were moving in flocks both north and south; Meadow-Pipits seen in fairly large numbers. A decrease in the number of Wheatears was noted; several Pied Wagtails, Swallows and House-Martins seen.

30th.—Still large numbers of Pipits, a few going south in flocks, as were also several Linnets. Only two Wheatears and very few Pied Wagtails seen. Greenfinches, Yellow Buntings, Swallows and House-Martins seen in small numbers.

October 1st.—No movement of birds was noted; numbers of Sky-Larks and Meadow-Pipits on the Denes. Two Wheatears, a Pied Wagtail, and a few House-Martins seen.

2nd.—Picked up a Hooded Crow on the tide-mark at Corton.

3rd.—Long-tailed Tits and Goldcrests were observed in fair numbers in the gardens overlooking the sea.

5th.—Linnets, Greenfinches, Mistle-Thrushes, and Meadow-Pipits were moving southwards in flocks; Linnets and Pipits were also noted going north in fair numbers. Two Bramblings observed flying south, and a Golden Plover was seen making

northwards, as was also a small flock of Pied Wagtails. Larks, Starlings, and Reed-Buntings were also moving north, while a few Larks were also going south. A considerable increase in the number of Robins and Hedge-Sparrows was noted; more Goldcrests and several Goldfinches seen. Swallows and House-Martins in large numbers. A number of Redwings were heard passing over the town at night.

8th.—The southward movement consisted of Linnets, Chaffinches, Starlings, Greenfinches and Meadow-Pipits. A flock of Ducks seen going south at sea. Mistle-Thrushes, Goldcrests and a few Goldfinches seen.

9th.—Moving southwards were observed a flock of Hooded Crows, one Brambling, a flock of Tree-Sparrows, and numbers of Linnets and Greenfinches; Linnets were also going north in fair numbers, and hundreds had dropped in upon the Denes. One Reed-Bunting, a Wheatear, several Mistle-Thrushes, Goldcrests, and Chaffinches seen. A flock of about twenty Pied Wagtails and eight Grey Wagtails observed at Oulton.

11th.—Sky-Larks the only species moving; a number of flocks flying south very low along the shore, and some a short way out at sea; the wind was very strong from E.S.E. Two flocks of Larks also arrived in from sea. A great number of Goldcrests had appeared; three Pied Wagtails and one Swallow seen.

13th.—Linnets, Greenfinches, and Larks were going south, while Larks and Tree-Sparrows were also going north. A flock of House-Martins and one Swallow seen. Lapwings were heard passing over at night.

14th.—Larks, Linnets, Greenfinches, Pipits and two Blue Tits were noted going south, while a large flock of Linnets were also passing north. A flock of Reed-Buntings dropped in from the north.

15th.—A flock of seven Hooded Crows came in from sea, and one was observed coasting south. Linnets, Larks and Greenfinches going south; Mistle-Thrushes, Tree-Sparrows and Hedge-Sparrows in two flocks were noted going north. Four Rock-Pipits had arrived. Several young cock Blackbirds seen.

18th.—One Rock-Pipit seen; flocks of Linnets passing both north and south; one flock of Starlings going north.

20th.—The southward movement consisted of Larks, Linnets, Pipits, Chaffinches and Greenfinches, while to the north Tree-Sparrows and Linnets were passing; the notes of House-Sparrows were heard among the migrating flocks of Linnets. Three Reed-Buntings, a Goldfinch, and several Great and Blue Tits had appeared.

23rd.—Linnets, Greenfinches and Chaffinches moving south, and a few flocks of Pipits and Linnets going north. A few flocks of Larks arriving in from sea. A number of Linnets and Starlings on the Denes, also a few Blue Tits and Yellow Buntings, a Grey Wagtail and a Goldfinch seen. In the evening a flock of several hundred Rooks came in from sea at Gorleston.

24th.—The movement of Finches, Larks and Starlings was still in progress, the flocks going both north and south. A Sheld-Duck was seen to come in from sea, as were also several Rooks; a Hooded Crow was also seen on the beach. Redwings were heard passing over the town at night.

26th.—Several flocks of Starlings, Larks and Rooks were observed coming in from over the sea; several flocks of each were also noted coasting south along with Linnets, Greenfinches, Chaffinches and Pipits. A few Siskins were heard among the flocks of Linnets; a flock of Mistle-Thrushes and a few Pied Wagtails making southwards.

28th.—I observed a large flock of Starlings rise from one of the coastal fields, and make away out to sea, flying S.E. Flocks of Larks, Linnets, Pipits and Starlings, and a Curlew noted passing south. An increase in the number of Blackbirds was noticed. The call notes of Redwings were heard at night.

29th.—A great inpouring of Larks and Starlings from sea; flocks of both passing south along with Lapwings and Linnets. A flock of Rooks arrived in at noon. Two Kestrels, several Hooded Crows, Mistle-Thrushes, Goldfinches and Greenfinches on the Denes.

30th.—A large movement of Larks to the south was noted; while Rooks, Linnets, Chaffinches and Greenfinches and Hooded Crows were also observed coasting south. A fairly large flock of Hooded Crows came in from over the sea. Rooks were also coming in on the 31st.

November 1st.—While walking in a quiet lane at Oulton I

observed quite a large number of Linnets, all singing together in the topmost branches of a large tree; this incident appeared to me to be most unusual.

2nd.—No migration was in progress; two Grey Wagtails seen.

3rd.—A Shore Lark was observed feeding among the marram-grass. Linnets, Greenfinches, Rooks, Jackdaws, and Hooded Crows were passing southwards; a few flocks of Larks were also arriving from over the sea.

6th.—I saw four House-Martins flying very feebly round an old mill at Corton. Redwings were heard passing over at night.

8th.—At daybreak about forty Hooded Crows were seen on the beach; they had apparently arrived during the night. Odd lots of Greenfinches, Linnets, Pipits, and Starlings and a flock of Wood-Pigeons going south. A bunch of Scoters seen a short distance out at sea; two Dunlins feeding at the tide-mark.

9th.—Rooks, Hooded Crows, and Sky-Larks were arriving in from sea; a Starling was picked up on the tide-mark; Curlews and Redwings were heard passing over at night.

16th.—Several small bunches of Scoters have stationed themselves just off Corton. Mr. Patterson informs me that in this quiet Corton bay a great bed of Radiated Trough-shells (*Macra stultorum*) and a considerable number of other forms of marine life upon which the Scoters feed lie on the sea-floor.

18th.—Three Snow-Buntings were observed on the shore and another making southwards.

23rd.—The notes of a great number of Waders and Redwings were heard over the town at night.

26th.—A great many Hooded Crows had arrived, also one Snow-Bunting seen. There was a slight southward movement of Linnets, Starlings, and Greenfinches.

28th.—A batch of about fifty Snow-Buntings had arrived; a fair number of Rock-Pipits and a flock of Ringed Plovers also appeared.

29th.—I was surprised to see a belated House-Martin, which was making southwards just on the outskirts of the town.

December 26th.—At Kessingland I picked up a Little Auk on

the tide-mark; a few Snow-Buntings were seen, and a bunch of Scoters were busily diving a few yards from the shore.

January 3rd, 1914.—Six Waxwings were shot at Oulton a few days since, three of which were shown to me in the flesh. A Little Auk found on the shore.

I am informed by Mr. Hunt that a flock of about ten Waxwings frequented a garden in the town for several weeks from December 17th.

17th.—Snow-Buntings and Rock-Pipits were still to be seen on the Denes in fair numbers; a Mistle-Thrush was heard singing quite in the centre of the town.

February 7th.—A Woodcock, flying east over this town in the early morning, struck a window in one of the highest buildings overlooking the sea; the bird fell injured into the road, and was secured by a lad, eventually coming into my possession; it succumbed a few hours after to its injuries.

12th.—A great many Fieldfares were noted at Oulton. A Chaffinch was heard in almost full song.

24th.—A movement of Starlings seen, one flock going out to sea in a direction S.E., and another flock coasting south. The following birds were heard singing:—Chaffinch, Blackbird, Coal-Tit, Mistle-Thrushes, Hedge-Sparrows, and Robins. Considerable numbers of Redwings were heard passing over on the night of the 25th.

27th.—A flock of Lapwings went away over the sea, flying due east; a short time after another flock came from the west, but on reaching the sea they turned inland again. Two flocks of Larks were noted coasting north.

28th.—I found the half-built nest of a Redbreast; it was undoubtedly the exceptionally mild weather that had induced the birds to build so early, for I was informed that a Redbreast's nest was found at Carlton containing the full complement of eggs on March 8th, and a Thrush's nest containing one egg was found at the same place on March 1st.

March 1st.—I observed a Partridge perched in a most unusual situation, namely, on the roof of a building in the main street. A small party of Coal-Tits had appeared; a large flock of Jackdaws were observed making northwards over Corton.

5th.—Four large flocks of Rooks came from the west, and after much circling and thinning out departed over sea due east.

During a heavy shower of rain on the night of the 8th I heard the notes of Redwings over the town.

10th.—A great mustering of Rooks, Jackdaws, Hooded Crows, and Starlings in the coastal fields; a flock of Rooks was observed making north a short distance out at sea, and a flock of Starlings was noted coasting north. A few flocks of Finches were moving southward.

14th.—A vast flock of Rooks seen flying south-east; later in the day another flock was seen flying to the west, apparently having come in from the sea.

22nd.—One flock of Rooks coasting north; numbers of Linnets and Meadow-Pipits were noted.

29th.—A few flocks of Linnets were passing southwards; a fair number of Larks had dropped in on to the Denes. On the 30th a great many Redwings passed over the town to the north.

31st.—A few flocks of Linnets, Chaffinches, and Greenfinches were noted going south.

April 1st.—A fairly large movement of Linnets, among which were a few Chaffinches and Greenfinches, all going southwards. I watched one flock of Greenfinches fly away out to sea due east; a flock of Jackdaws followed the same course a short time after.

4th.—Only a very slight movement of Finches was noted.

6th.—A Wheatear and a Willow-Wren had arrived. Three flocks of Rooks were noted coming in from sea S.E., and then coasting along north; one flock put out to sea going due east. A few Linnets passed to the south.

8th.—A large flock of Rooks and Jackdaws wheeling round just out at sea, evidently shirking the journey over the water. Several lots of Rooks were seen coming in from sea, singly and in small groups; it may have been that these were returning from a flock that had made its departure before we arrived on the spot. A fair number of Linnets, a few Greenfinches, and a Chaffinch or two going north.

9th.—A Cormorant was observed flying south along the shore. A few flocks of Linnets going both north and south, a

flock of Chaffinches making south and a few Greenfinches north.

10th.—Several flocks of Linnets and a few Greenfinches and Chaffinches moving both north and south. A flock of Rooks and two Hooded Crows coasting south. A Willow-Wren and a Wheatear seen; first Swallow seen at Oulton, and two others on the 11th.

12th.—Three Swallows, two Wheatears, a Willow-Wren, and three Ringed Plovers noted. While cycling a few miles inland I heard a great number of Willow-Wrens and saw several Swallows.

14th.—Linnets going north in great numbers, as were also a few Greenfinches, a flock of Tree-Sparrows, a Sand-Martin, and ten Swallows. A flock of Rooks and Jackdaws, with one Hooded Crow, coasting south.

15th.—Two Willow-Wrens and a House-Martin were noted. Only a few Linnets and Greenfinches passing north; large numbers of both species on the Denes.

16th.—Two Wheatears, two Willow-Wrens, a Swallow, and a House-Martin seen. Linnets and Greenfinches going north in fair numbers.

17th.—A flock of Starlings and a few Linnets passing south, while going north was a fair number of Linnets and a flock of Greenfinches.

19th.—A Nightingale, a Lesser Whitethroat, and a Willow-Wren seen; also three Swallows. Coasting south were a few bunches of Linnets.

22nd.—I observed a Merlin going northward a short distance out at sea. A Nightingale and two Willow-Wrens had arrived, and a Cuckoo was heard for the first time at Carlton. A few flocks of Linnets and a flock of Rooks going to the north.

23rd.—Two Tree-Pipits, four Common Whitethroats, two Nightingales, and four Willow-Wrens had appeared; a Swallow was also seen.

28th.—Three Cormorants were observed making southwards, and the following migrants were noted:—A Wryneck, Cuckoo, several Common Whitethroats and Willow-Wrens, a Nightingale, and a few Swallows.

May 6th.—Five Common Terns had arrived, and an increase

in the number of Common Whitethroats was noted; also a brood of young Stonechats able to fly.

7th.—Three Swifts were seen.

8th.—The number of Terns had increased considerably, as had also the number of Swallows and House-Martins. A Turtle-Dove appeared.

10th.—An arrival of Swifts was noted, a fair number being seen.

14th.—Swifts had arrived at their breeding-haunts in the town. While walking through a quiet lane my attention was drawn to the most unusual antics of a Starling, which was fluttering head downwards on the branch of a young sycamore tree. On examining it closer I discovered its legs to be securely fastened to the branch with a length of fairly stout string, and it was not without some difficulty that I was able to release it.

While sailing through the Channel on their voyage home from the West of England, some friends on board the Lowestoft trawler 'Giralda' inform me that a Wheatear came on board, and Swallows and Martins were crossing toward the English coast in small parties.

NOTES ON THE FAUNA OF THE COUNTRY OF
THE CHESSE AND GADE.

BY T. E. LONES, M.A., LL.D., B.Sc.

(Continued from p. 212.)

SPECIMENS of four species of *Metopidia* have so far been obtained by me; these species are *M. solidus*, Gosse, *M. oxysternum*, Gosse, *M. lepadella*, Ehren., and *M. acuminata*, Ehren. Of these species, *M. solidus* was the most generally distributed and furnished the largest number of specimens, the specimens of *M. oxysternum* were somewhat more numerous than those of *M. lepadella*, and only three specimens of *M. acuminata* have been obtained. These statements give some idea of the relative frequency of occurrence of these four species in the country of the Chess and Gade, for it has been my practice to obtain samples of water from the various localities of the district at all seasons of the year and exhaust these samples as completely as possible. Notes have been made of all forms of life seen, including some I have been unable to identify, and, in some cases, the numbers have been counted. In this way, if there is any preponderance of a species, the notes indicate this, and, in some cases, give an idea of the relative numbers of specimens.

11. *Metopidia solidus*, Gosse. The specimens of this species were usually obtained by dredging at or near the surface, where aquatic plants were plentiful. When on the slide and not engaged amongst the vegetable matter which happened to be there, they swam about rather slowly, often turning sideways and swimming on their backs, and occasionally assuming an upright position so as to show their bodies in end view. In this position, the lorica was seen to be somewhat flat, convex on both dorsal and ventral sides, and with the central part of the dorsal side arched. The jointed foot was always extended, and carried two tapering and pointed toes, which were often closed

tightly together, like the jaws of a pair of pliers. The foot was often moved to the right or left and allowed the rounded notch at the hinder end of the lorica to be seen distinctly. When swimming with their dorsal surfaces fully exposed, the characteristic marks or milling, a little within and round the edge of the nearly circular lorica, could be easily seen in some specimens, but in others the milling was less distinct. The lorica itself was colorless and very transparent, and, when the Rotifer was seen in side view, its hook-shaped frontal hood was a conspicuous object. The length of the lorica was about $\frac{1}{160}$ in.

All the specimens were obtained in spring, summer, or early autumn, chiefly from the Berkhamsted Castle moats, and the pools of Langleybury and Parsonage Farm, Abbots Langley. On July 21st, 1913, many specimens of this species were obtained from the inner moat at Berkhamsted Castle. Many loricas and numerous living specimens were obtained on May 12th, 1913, from Langleybury Pool, and about the same time this year, May 2nd, 1914, five specimens were taken from the same pool. On March 24th, 1913, Parsonage Farm Pool yielded some empty loricas only, some with remains of the foot attached, but many living specimens were obtained from the same pool on August 18th, 1913. There are parts of the water-cress-beds, temporarily or permanently out of use and containing a miscellaneous series of aquatic plants, which yield some interesting forms of life. In one of these disused parts near Watford, a few specimens of *M. solidus* were obtained on September 16th, 1913. A solitary specimen was obtained from Chesham Road Pool on May 26th, 1914. This specimen was not as clear and healthy looking as the specimens obtained from the moat and the other pools mentioned above.

12. *Metopidia oxysternum*, Gosse. This species has been obtained from Berkhamsted Castle moats and Kings Langley Lodge Pool. So well-defined and peculiar is the form of *M. oxysternum* that it can be identified at once. The specimens which, owing to their free and energetic movements, best showed the characteristic features of the species were obtained on July 21st, 1913, from the inner moat, and on April 13th, 1914, from Kings Langley; in the moat they were found together with a much larger number of specimens of *M. solidus*.

In dorsal and ventral views, the lorica was somewhat oval, but it was in side and end views that its most striking peculiarities were seen. Fig. 9 is a side view of one of the specimens, seen most conveniently when moving in and out among the small quantity of vegetable matter that was on the slide; its arched back, and its sinuous ventral outline, due to the presence of a keel, aptly compared by Messrs. Hudson and Gosse to the sternum of a bird, were clearly seen. Fig. 10 is an end view of the Rotifer, drawn while it was anchored to the slide and had its body inclined to the vertical for a short time, but not inclined sufficiently to show the maximum height of



Fig. 9.



Fig. 10.

the central ridge. In consequence of the possession of these structural features and also of curved facets on parts of the lorica, the Rotifers presented all kinds of angular and curved outlines as they swarm about on the slide.

13. *Metopidia lepadella*, Ehren. The various specimens of this species examined were usually engaged in moving slowly over the *débris* on the slide, their jointed and freely movable hoods being used to rake about amongst the material. When swimming freely they often turned sideways or on end so as to show clearly the peculiar form of the somewhat oval lorica, which was nearly flat on its ventral and arched on its dorsal side, its form in end view being very nearly that of a segment of a circle. Like other species of *Metopidia*, *M. lepadella* always kept the foot extended.

On going over my notes to collect the material for the genus *Metopidia*, I expected to find the records of *M. lepadella* to be more frequent. With the exception of some doubtful finds in 1912, chiefly in waters connected with the lower Gade, the only time at which a good number of specimens was obtained was on July 21st, 1913, when about ten specimens were taken from the inner moat at Berkhamsted Castle. At that time the water in the moat was up to the level of the culvert at the south-eastern part, a great quantity of fresh and green weeds was present, and the forms of life, from infusorians to Water Newts, were numerous. Since that time, with the exception of a few *Floscularias* and some specimens of *Stephanops lamellaris*, no Rotifers of any importance have been obtained by me from the moats. During the dry weather of the ensuing months, evaporation and percolation into the underlying chalk caused the water to disappear until, at the end of September, many parts were dry. In October and November the moats were drier still; on January 27th, 1914, they were quite dry, and it was not until the spring of this year that I again found much water in the moats. It was much the same with many of the pools. The evaporation and percolation no doubt vary greatly in the different pools, and small springs may compensate, in some of the pools, for part of the loss by these agencies. However this may be, the water level of every pool sank, and, in particular, the pools of Langleybury, Parsonage Farm, Chesham Road, Cholesbury Common, and Wigginton became very low, while less permanent pools, such as those at Leverstock Green, became dry. Chipperfield Common Pool, which usually maintains its level very well, was also low; on April 13th last, for instance, its water-level was a foot below the normal.

Not only were the pools low, but their weeds, at other times so fresh and green, were in a state of decomposition, and what water there was had a decidedly pungent and unpleasant smell. It seemed to be natural that, under such conditions, important finds of *Metopidia* or of most other Rotifers could not be obtained. These remarks on the way in which the Rotiferan fauna of the country of the Chess and Gade is liable to be impoverished will not, I trust, be considered uninteresting.

Reference has already been made to some doubtful records,

in 1912, of species of *Metopidia*. If these are neglected, the notes give only one instance of the occurrence of *M. lepadella* in company with *M. solidus*. Herr L. Bilfinger, collecting from many localities in Wurtemberg, says ('Jahreshefte Ver. vaterländ. Naturkunde in Württ. Stuttgart, 1892,' p. 117) that the two species were almost always found together, *M. lepadella* being very common and *M. solidus* abundant. In the country of the Chess and Gade, *M. lepadella* seems to be decidedly less common than *M. solidus*, and, during the years 1913 and 1914 at least, I found *M. solidus* on many occasions without finding any specimens of *M. lepadella*.

14. *Metopidia acuminata*, Ehren.—The only specimens of this small Rotifer were obtained from Langleybury Pool on May 12th, 1913. Their loricas were of elegant form, somewhat oval, with a deep median notch at the oral end, and a gracefully curved terminal point, which was conspicuously shown when the Rotifer swung its foot to the right or the left, as it frequently did. The short jointed foot carried two acicular toes, which opened and closed as it were by a snap. The length of the specimens, three in number, was less than $\frac{1}{200}$ in.

15. *Anuraea brevispina*, Gosse.—This Rotifer, very common in the country of the Chess and Gade, is considered by some to be a variety of *A. aculeata*, Ehren. It will be more convenient here to describe it as if it were a distinct species, more particularly because there is no record in my notes of its being found together with specimens of Ehrenberg's *A. aculeata*. On going through these notes a short time ago I was expecting to find that these two Rotifers had sometimes been found together, or, at least, in the same pool at different times, but there was no record of a single instance of the kind.

Many specimens were obtained from Chipperfield Common Pool on August 4th, 1913, by dredging at a depth of about three feet. They swam somewhat slowly, at the same time performing a succession of rolling and dipping movements which allowed the structural features to be well seen, such as the convex dorsal and concave ventral surfaces of the lorica, its short posterior spines, its curved sides, and its sickle-shaped antlers. A rather large number of specimens was also obtained from the same pool on January 27th, 1914, some carrying eggs;

and again, on April 13th, 1914, when the pool was comparatively very low and its fauna unusually poor, several specimens were obtained.

Between Hastoe and Shire Lane (part of the boundary between Herts and Bucks) is a muddy pool which maintains its water level fairly well. The largest number of specimens of *A. brevispina* obtained by me on a single occasion was the result of a careful dredging of the pool on May 26th, 1914. I had dredged the same pool in October of the previous year, but did not obtain any Rotifers of interest. On May 26th, 1914, however, a very large number of forms of life was obtained, and of these the specimens of *A. brevispina* constituted a large proportion. Most of the specimens were carrying an oval egg of a pale pink colour, the general colour of the body of the Rotifer being light yellow. Some empty cases were also seen and these showed the polygonal facets very clearly. It was astonishing to notice how large a proportion of the specimens were attached to one another, not only in pairs, but occasionally in threes. They were, in some cases, firmly connected, for one pair, attached laterally with their oral parts close together, went right through the space between the valves of a vigorous *Daphnia pulex*, and, after being literally kicked out, remained attached together. The various pairs were attached in all kinds of relative positions, parallel, crosswise, and inclined.

On the same day, May 26th, 1914, numerous specimens, exactly like those from Hastoe Pool, in form, colour of body, and colour of eggs, were taken from Chesham Road Pool, which was, it may be said, dirtier than I had seen it before, considering that it was fairly full. The phenomena of life of the specimens were different from those at Hastoe Pool, for comparatively few were carrying eggs, and all the specimens seen were swimming quite independently.

16. *Anuraea aculeata*, Ehren.—It may be mentioned, at the outset, that I had obtained numerous specimens of *A. brevispina* before any specimens of *A. aculeata* were found. These were first obtained on April 11th, 1914, by dredging in water three feet deep in Bedmond Pool. Many specimens were also obtained by dredging in shallow water and among the sedges of Kings Langley Lodge Pool on April 13th, 1914. A few

specimens, some carrying eggs, were dredged on May 26th, 1914, from the clear water of the Cholesbury Common Pool, which is on the side of the Common farthest from Hawridge; a few empty loricas were also obtained at the same time.

Before passing on to describe the next species, it may be pointed out that so far *A. brevispina* has been found in the pools of Chipperfield Common, Hastoe, and Chesham Road, while *A. aculeata* has been found in the pools of Bedmond, Kings Langley Lodge, and Cholesbury Common, as already set forth. The two sets of pools named evidently have characteristics favouring the presence of *A. brevispina*, in one case, and of *A. aculeata* in the other. What these characteristics really are I am unable to say, but it may be given as a statement of fact that I have found the waters of the said pools of Bedmond, Kings Langley Lodge, and Cholesbury Common to be decidedly clearer and fresher than those of Chipperfield Common, Hastoe, and Chesham Road. Hastoe Pool, which yielded such a vast number of specimens of *A. brevispina* on May 26th, 1914, was much less clear than any of the other pools mentioned.

17. *Anuraea cochlearis*, Ehren.—This small Rotifer has been obtained from the Grand Junction Canal and Kings Langley Lodge Pool. On October 15th, 1913, a few specimens were obtained by dredging in the canal at a part about one-quarter of a mile south of Tring Station, and from the same part of the canal numerous living specimens and several loricas were dredged on May 26th, 1914. Many specimens were obtained on April 13th, 1914, from Kings Langley Lodge Pool. They swam forward rapidly, at the same time rolling over or from side to side. The main feature of the specimens, that to which the specific name owes its origin, was the spoon-shaped lorica, the "handle" of the spoon being a stout spine, the whole resembling some forms of the old Roman *cochlear*, which was used not only for eating eggs but also shell-fish.

Dr. Lauterborn made a detailed study of the variations of *A. cochlearis* in size and form, paying particular attention to variations in the length of the posterior spine. He examined a large number of specimens from pools and parts of the Rhine near Neuhausen, Rosheim, Ludwigshafen, and other places, and gave his results in several papers. In one of these (Verh.

Naturhist-Med. Ver. Heidelberg, vol. 7, 1903, pp. 529-621, of which I have seen extracts only) he concluded that these variations are mainly due to differences in the nature of the waters and to seasonal variations of temperature. He found, *e.g.* that, during the winter months, the long-spined forms were obtained, and, during the late spring and summer months, the short-spined and spineless forms. The specimens so far examined by me had posterior spines about as long as that of the type-form, and showed only trifling differences in length. They were obtained, as above stated, in the months of April, May, and October, but the observations made are insufficient to decide to what extent the species varies in the country of the Chess and Gade.

18. *Brachionus pala*, Ehren.—This species has been found in the pools of Chipperfield Common and Kings Langley Lodge, and, quite recently, in vast numbers in Coxpond, between Leverstock Green and the Saracen's Head, on the way to Hemel Hempstead. The specimens examined usually swarm forwards rapidly, turning slowly about the long axis of the lorica, but some remained anchored for a long time. They differed greatly in the frequency with which they extended their flexible feet and lashed out with these. Most of them swam about for a long time without extending their feet, others did so occasionally, and only a few frequently; a very little cocaine solution soon caused frequent extension. The structural features of this Rotifer were always well seen, its four, strong, tapering, and sharp oral spines, cervical bright red eye, and powerful masticatory apparatus being especially conspicuous. In some specimens, obtained from Kings Langley Lodge Pool on April 13th, 1914, the eye-spot was exceptionally bright, and there appeared to be a faint pink coloration in the neighbouring oral parts of the Rotifers.

By far the greatest number of specimens of *B. pala* was obtained from Coxpond on July 14th, 1914. There have been other occasions on which an exceptionally large number of specimens of a species has been obtained, *e.g.* on October 3rd, 1913, when a vast number of *B. rubens* was found in the pool on the eastern side of Potten End, and on May 26th, 1914, when a great number of *Anuraea brevispina* was dredged from Hastoe

Pool. On all such occasions the numbers of specimens obtained were less than the number of specimens of *B. pala* from Coxpond. It would not be an exaggeration to say that, in the last case, every cubic millimetre of water in the sample bottles contained a dozen or more specimens, some being especially fine and large. The lorica of one of the largest examined was $\frac{1}{85}$ in. long. Many of them were carrying eggs, some a single one, and others two. In most of the specimens the mastax was of exceptionally large size.

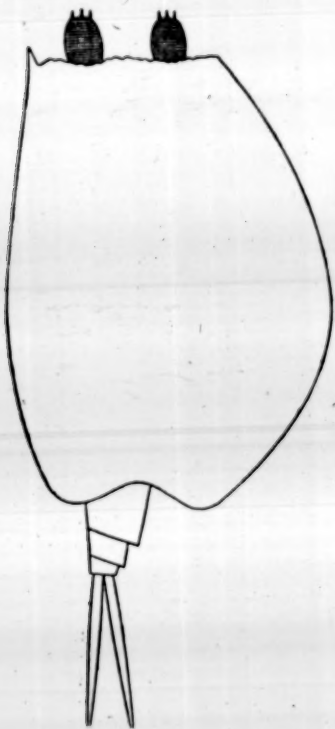


Fig. 11.

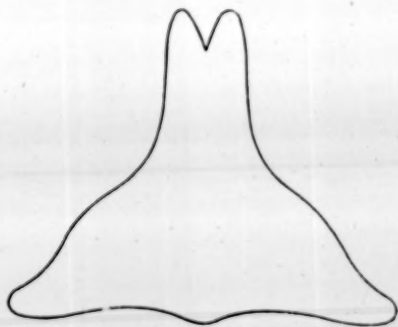


Fig. 12.

19. *Diplax trigona*, Gosse.—This Rotifer was not obtained until March 26th, 1914, when two specimens were seen during a careful examination of the washings from a fine silk net through which about two quarts of water from Langleybury Pool had been passed. One of the specimens was being examined, and was swimming about slowly, occasionally turning on its side or plunging so as to show its somewhat triangular outline, when it was very suddenly attacked by a young *Cyclops*, which abandoned it after a few seconds. So

violent was the attack that it seemed likely that the Rotifer would have its foot and toes torn off, and its lorica so mutilated as not to be worth sketching. When found again the Rotifer was lying in a somewhat tilted position on its side quite dead, and with its oral part injured, this being bitten or broken so as to present jagged edges. Immediately after the attack two of the numerous specimens of infusorians (*Coleps hirtus*, Ehren.), which had been swimming about without attempting to molest the Rotifer while living, buried themselves to some extent in its injured oral parts. Fig. 11 represents the Rotifer and its assailants at this time. Other specimens of the same infusorians did the same, so that, at different times, there were three, five, six, and eight of them attacking the dead Rotifer. The total length of the Rotifer was nearly $\frac{1}{70}$ in.; that of the infusorians was about $\frac{1}{800}$ in. The only other specimens of *D. trigona* obtained were dredged from Kings Langley Lodge Pool on April 13th, 1914.

20. *Eretmia cubeutes*, Gosse.—In the year 1913 specimens of this Rotifer were obtained from the pools of Parsonage Farm and Chipperfield Common. Usually the numbers obtained were small, but on one occasion, March 24th, 1913, the Rotifer was exceptionally common in Parsonage Farm Pool. The lorica was ellipsoidal, but with the oral part truncated and presenting a toothed edge, with the teeth regular in size and shape. A most striking feature of this Rotifer is the mosaic-like pattern of its lorica, the elements which correspond to the squares of an ordinary mosaic being arranged diagonally and having little pyramids built upon them. With this arrangement of the elements the surface of the lorica presents a large number of pointed knobs, and the oral teeth are simply the pointed corners of the foremost row of elements.

The specimens usually swam about rapidly, at the same time rotating about their long axis; the dorsal and ventral processes and the four posterior spines could not be counted while these rapid movements were going on, the effect being usually to produce an impression of two well-defined spines, always in focus more or less distinctly. Sometimes the Rotifers assumed a vertical position, remaining practically in the same place and appearing like rotating toothed wheels.

21. *Triarthra longiseta*, Ehren.—Specimens of this Rotifer can almost always be obtained by dredging the deeper parts of Chipperfield Common Pool; on one occasion, April 18th, 1914, no specimens were obtained, but this is the only record I have of failure to obtain *T. longiseta*, and it may be said that the pool presented a peculiarly lifeless aspect on the date mentioned, and very few forms of life of any kind were obtained from it. On August 4th, 1913, many specimens were obtained, and one of them was carrying an oval egg near the hinder end of its bag-shaped body. The two small red eye-spots near the oral end were clearly seen, and the three long oar-like processes were very conspicuous. The Rotifers often swam rapidly forwards, and at the same time turned about their long axes. Sometimes they darted suddenly across the field of view, or even quite out of it. This sudden movement seemed to be due mainly to the action of the two lateral processes, but the movement was always so sudden and swift that I could never decide what really happened, or to what extent the median process assisted. When the Rotifers were swimming about steadily, the processes, either the two lateral ones or all three, were swung forwards and brandished vigorously. By far the greatest number of specimens obtained at one time was dredged from beneath the ice, on January 27th, 1914, and very many of them were carrying eggs.

22. *Furcularia molaris*, Gosse.—Between the beautifully situated little village of Ashley Green and Chesham are several small pools, and in one of these, near the Chesham Road, not far from 'The Thorn,' was found, on March 11th, 1913, a single specimen of *F. molaris*. The Rotifer was first detected creeping along a specimen of *Daphnia pulex*. Its main distinctive features were very clearly seen: its stout, somewhat oval body and thick truncated head; its long jointed foot, ending in two rather long, divergent, blade-like toes; its bright red eye-spot, and its large alimentary canal filling its body cavity to a large extent; several parts of the alimentary canal were of a brown colour. No attempt was made to draw the Rotifer until it had been narcotized, for it was quite



Fig. 13.

restless and its movements were too quick to enable its structure to be fairly seen. Fig. 13 represents the Rotifer as it appeared, partly contracted, after narcotization.

23. *Hydatina senta*, Ehren.—This also is a Rotifer obtained by me from one pool only, but while the single specimen of *F. molaris*, above described, seemed to be in the collecting bottle by accident, there is no doubt that *H. senta* was plentiful and could scarcely be missed in the pool whence it was obtained. This was a small, shallow pool on Boxmoor Common, in process of being filled with rubbish, and containing water of a very dirty appearance, although not muddy. In order to economize in the use of my limited supply of collecting bottles, for I was going as far as Dagnall, in the extreme north-eastern part of the country of the Gade, the smallest collecting-bottle was used. Examining the contents of this bottle a day or two afterwards, a splendid specimen of *H. senta* was found and served excellently for all purposes of microscopic examination of the species. Although the water in which the Rotifer lived was repulsive to a degree, the Rotifer itself was a beautiful object beneath the microscope. The rounded prominences on its oral end carried a number of styles which vibrated rapidly and, appearing like so many flashing rays of light, produced quite a dazzling effect on the eyes. The Rotifer often anchored itself, and sometimes swam about slowly, constantly twisting about or doubling upon itself. A large part of its alimentary canal was yellow or greenish-yellow, but with a dark-coloured central part, and, after narcotization, bright green *Euglenæ* were discharged in large numbers from the cloaca.

In the autumn of 1912 the above-mentioned pool swarmed with Turbellarian and other worms, and no Rotifers were obtained from it. On June 8rd, 1913, when the specimen described above was obtained, the pool must have contained very many specimens of *H. senta*. At the present time (July 14th, 1914), the pool is absolutely dry, and is so far filled in that in the wettest season it will scarcely hold more than six inches of water. As long as a pool forms there, however, this Rotifer will probably be found, especially in spring and early summer. In his account of the Rotiferan fauna of the region of Lake Geneva, Mons. E. F. Weber says (*Revue Suisse de*

Zool., &c., vol. v., Geneva, 1898, p. 420): "This species is rather rare in our district, but when we have the fortune to come across a pool which is suitable for it we may be certain of finding it again every year and always in abundance, especially in spring. Unfortunately, the localities where it can be met with are very scarce, and, at the Junction, the pool whence I used to obtain specimens is now filled up." The pool on Boxmoor Common will soon share, I think, the same fate as M. Weber's pool.

24. *Ecistes stygis*, Gosse.—This seems to be a very rare Rotifer. One solitary specimen is all that I have seen from the numerous water samples taken during three years from a large number of the pools, and from the streams and Canal in the Chess and Gade country. This solitary specimen was obtained from Parsonage Farm Pool, Abbots Langley, on September 6th, 1912. It was embedded in a little mass of fine brown fibres, extending up the stem of the Rotifer for about two-thirds of its length. This mass of fibres was, as far as my memory serves me, from a large stone at one corner of the pool, having its submerged parts covered with a thin coating of similar vegetable matter, so that *Ecistes* had a very firm support. The specimen itself might be said to have been a nearly straight trumpet, with a magnificent circular and richly ciliated mouth or corona. When extended, the Rotifer swayed slowly about its foot, and its corona turned slowly in various directions, so that the inclination of its plane to the axis of the stem varied. A slight disturbance at once caused it to spring back into its casing, and when the disturbance ceased the Rotifer soon extended itself slowly.

(To be continued.)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, AUSTRALIA, 1914.

ADDRESS BY PROFESSOR WILLIAM BATESON, M.A., F.R.S., *President*.

(Continued from p. 318.)

PART II.—SYDNEY.

AT Melbourne I spoke of the new knowledge of the properties of living things which Mendelian analysis has brought us. I indicated how these discoveries are affecting our outlook on that old problem of natural history, the origin and nature of Species, and the chief conclusion I drew was the negative one, that, though we must hold to our faith in the Evolution of Species, there is little evidence as to how it has come about, and no clear proof that the process is continuing in any considerable degree at the present time. The thought uppermost in our minds is that knowledge of the nature of life is altogether too slender to warrant speculation on these fundamental subjects. Did we presume to offer such speculations they would have no more value than those which alchemists might have made as to the nature of the elements. But though in regard to these theoretical aspects we must confess to such deep ignorance, enough has been learnt of the general course of heredity within a single species to justify many practical conclusions which cannot in the main be shaken. I propose now to develop some of these conclusions in regard to our own species, Man.

In my former Address I mentioned the condition of certain animals and plants which are what we call "polymorphic." Their populations consist of individuals of many types, though they breed freely together with perfect fertility. In cases of this kind which have been sufficiently investigated it has been found that these distinctions—sometimes very great and affecting most diverse features of organization—are due to the presence or absence of elements, or factors as we call them, which are treated in heredity as separate entities. These factors and their combinations produce the characteristics which we perceive. No individual can acquire a particular characteristic unless the requisite factors entered into the composition of that individual at fertilization, being received either from the father or from the mother or from both, and consequently no individual can pass on to his offspring positive characters which he does not himself possess. Rules of this kind have already been traced in operation in the human species; and though I admit that an assumption of some magnitude is involved when we extend the application of the same system to human characteristics in general, yet the assumption is one which I believe we are fully justified in making. With little hesitation we can now declare that the potentialities and aptitudes, physical as well as mental, sex, colours, powers of work or invention, liability to diseases, possible duration of life, and the other features by which the members of a mixed

population differ from each other, are determined from the moment of fertilization; and by all that we know of heredity in the forms of life with which we can experiment we are compelled to believe that these qualities are in the main distributed on a factorial system. By changes in the outward conditions of life the expression of some of these powers and features may be excited or restrained. For the development of some an external opportunity is needed, and if that be withheld the character is never seen, any more than if the body be starved can the full height be attained; but such influences are superficial and do not alter the genetic constitution.

The factors which the individual receives from his parents and no others are those which he can transmit to his offspring; and if a factor was received from one parent only, not more than half the offspring, on an average, will inherit it. What is it that has so long prevented mankind from discovering such simple facts? Primarily the circumstance that as man must have *two* parents it is not possible quite easily to detect the contributions of each. The individual body is a *double* structure, whereas the germ-cells are *single*. Two germ-cells unite to produce each individual body, and the ingredients they respectively contribute interact in ways that leave the ultimate product a medley in which it is difficult to identify the several ingredients. When, however, their effects are conspicuous the task is by no means impossible. In part also even physiologists have been blinded by the survival of ancient and obscurantist conceptions of the nature of man by which they were discouraged from the application of any rigorous analysis. Medical literature still abounds with traces of these archaisms, and, indeed, it is only quite recently that prominent horse-breeders have come to see that the dam matters as much as the sire. For them, though vast pecuniary considerations were involved, the old "homunculus" theory was good enough. We were amazed at the notions of genetic physiology which Professor Baldwin Spencer encountered in his wonderful researches among the natives of Central Australia; but in truth, if we reflect that these problems have engaged the attention of civilised man for ages, the fact that he, with all his powers of recording and deduction, failed to discover any part of the Mendelian system is almost as amazing. The popular notion that any parents can have any kind of children within the racial limits is contrary to all experience, yet we have gravely entertained such ideas. As I have said elsewhere, the truth might have been found out at any period in the world's history if only pedigrees had been drawn the right way up. If, instead of exhibiting the successive pairs of progenitors who have contributed to the making of an ultimate individual, some one had had the idea of setting out the posterity of a single ancestor who possessed a marked feature such as the Habsburg lip, and showing the transmission of this feature along some of the descending branches and the permanent loss of the feature in collaterals, the essential truth that heredity can be expressed in terms of presence and absence must have at once become apparent. For the descendant is not, as he appears in the conventional pedigree, a sort of pool into which each

tributary ancestral stream has poured something, but rather a conglomerate of ingredient-characters taken from his progenitors in such a way that some ingredients are represented and others are omitted.

Let me not, however, give the impression that the unravelling of such descents is easy. Even with fairly full details, which in the case of man are very rarely to be had, many complications occur, often preventing us from obtaining more than a rough general indication of the system of descent. The nature of these complications we partly understand from our experience of animals and plants which are amenable to breeding under careful restrictions, and we know that they are mostly referable to various effects of interaction between factors by which the presence of some is masked.

Necessarily the clearest evidence of regularity in the inheritance of human characteristics has been obtained in regard to the descent of marked abnormalities of structure and congenital diseases. Of the descent of ordinary distinctions such as are met with in the normal healthy population we know little for certain. Hurst's evidence, that two parents both with light-coloured eyes—in the strict sense, meaning that no pigment is present on the front of the iris—do not have dark-eyed children, still stands almost alone in this respect. With regard to the inheritance of other colour-characteristics some advance has been made, but everything points to the inference that the genetics of colour and many other features in man will prove exceptionally complex. There are, however, plenty of indications of system comparable with those which we trace in various animals and plants, and we are assured that to extend and clarify such evidence is only a matter of careful analysis. For the present, in asserting almost any general rules for human descent, we do right to make large reservations for possible exceptions. It is tantalising to have to wait, but of the ultimate result there can be no doubt.

I spoke of complications. Two of these are worth illustrating here, for probably both of them play a great part in human genetics. It was discovered by Nilsson-Ehle, in the course of experiments with certain wheats, that several factors having the same power may co-exist in the same individual. These cumulative factors do not necessarily produce a cumulative effect, for any one of them may suffice to give the full result. Just as the pure-bred tall pea with its two factors for tallness is no taller than the cross-bred with a single factor, so these wheats with three pairs of factors for red colour are no redder than the ordinary reds of the same family. Similar observations have been made by East and others. In some cases, as in the *Primulus* studied by Gregory, the effect is cumulative. These results have been used with plausibility by Davenport and the American workers to elucidate the curious case of the mulatto. If the descent of colour in the cross between the negro and the white man followed the simplest rule, the offspring of two first-cross mulattos would be, on an average, one black: two mulattos: one white, but this is notoriously not so. Evidence of some segregation is fairly clear, and the deficiency of real whites may perhaps be accounted for on the hypothesis of cumulative factors, though by the

nature of the case strict proof is not to be had. But at present I own to a preference for regarding such examples as instances of imperfect segregation. The series of germ-cells produced by the cross-bred consists of some with no black, some with full black, and others with intermediate quantities of black. No statistical tests of the condition of the gametes in such cases exist, and it is likely that by choosing suitable crosses all sorts of conditions may be found, ranging from the simplest case of total segregation, in which there are only two forms of gametes, up to those in which there are all intermediates in various proportions. This at least is what general experience of hybrid products leads me to anticipate. Segregation is somehow effected by the rhythms of cell-division, if such an expression may be permitted. In some cases the whole factor is so easily separated that it is swept out at once; in others it is so inter-mixed that gametes of all degrees of purity may result. That is admittedly a crude metaphor, but as yet we cannot substitute a better. Be all this as it may, there are many signs that in human heredity phenomena of this kind are common, whether they indicate a multiplicity of cumulative factors or imperfections in segregation. Such phenomena, however, in no way detract from the essential truths that segregation occurs, and that the organism cannot pass on a factor which it has not itself received.

In human heredity we have found some examples, and I believe that we shall find many more, in which the descent of factors is limited by sex. The classical instances are those of colour-blindness and hæmophilia. Both these conditions occur with much greater frequency in males than in females. Of colour-blindness at least we know that the *sons* of the colour-blind man do not inherit it (unless the mother is a transmitter) and do not transmit it to their children of either sex. Some, probably all, of the daughters of the colour-blind father inherit the character, and though not themselves colour-blind, they transmit it to some (probably, on an average, half) of their offspring of both sexes. For since these normal-sighted women have only received the colour-blindness from one side of their parentage, only half their offspring, on an average, can inherit it. The sons who inherit the colour-blindness will be colour-blind, and the inheriting daughters become themselves again transmitters. Males with normal colour-vision, whatever their own parentage, do not have colour-blind descendants, unless they marry transmitting women. There are points still doubtful in the interpretation, but the critical fact is clear, that the germ-cells of the colour-blind man are of two kinds: (i) those which do not carry on the affection and are destined to take part in the formation of sons; and (ii) those which do carry on the colour-blindness and are destined to form daughters. There is evidence that the ova also are similarly predestined to form one or other of the sexes, but to discuss the whole question of sex-determination is beyond my present scope. The descent of these sex-limited affections nevertheless calls for mention here, because it is an admirable illustration of factorial predestination. It moreover exemplifies that *parental polarity* of the zygote to which

I alluded in my first Address, a phenomenon which we suspect to be at the bottom of various anomalies of heredity, and suggests that there may be truth in the popular notion that in some respects sons resemble their mothers and daughters their fathers.

As to the descent of hereditary diseases and malformations, however, we have abundant data for deciding that many are transmitted as dominants and a few as recessives. The most remarkable collection of these data is to be found in family histories of diseases of the eye. Neurology and dermatology have also contributed many very instructive pedigrees. In great measure the ophthalmological material was collected by Edward Nettleship, for whose death we so lately grieved. After retiring from practice as an oculist he devoted several years to this most laborious task. He was not content with hearsay evidence, but travelled incessantly, personally examining all accessible members of the families concerned, working in such a way that his pedigrees are models of orderly observation and recording. His zeal stimulated many younger men to take part in the work, and it will now go on, with the result that the systems of descent of all the common hereditary diseases of the eye will soon be known with approximate accuracy.

Give a little imagination to considering the chief deduction from this work. Technical details apart, and granting that we cannot wholly interpret the numerical results, sometimes noticeably more and sometimes fewer descendants of these patients being affected than Mendelian formulæ would indicate, the expectation is that in the case of many diseases of the eye a large proportion of the children, grandchildren, and remoter descendants of the patients will be affected with the disease. Sometimes it is only defective sight that is transmitted; in other cases it is blindness, either from birth or coming on at some later age. The most striking example perhaps is that of a form of night-blindness still prevalent in a district near Montpellier, which has affected at least one hundred and thirty persons, all descending from a single affected individual* who came into the country in the seventeenth century. The transmission is in every case through an affected parent, and no normal has been known to pass on the condition. Such an example well serves to illustrate the fixity of the rules of descent. Similar instances might be recited relating to a great variety of other conditions, some trivial, others grave.

At various times it has been declared that men are born equal, and that the inequality is brought about by unequal opportunities. Acquaintance with the pedigrees of disease soon shows the fatuity of such fancies. The same conclusion, we may be sure, would result from the true representation of the descent of any human faculty. Never since Galton's publications can the matter have been in any doubt. At the time he began to study family histories even the broad

* The first human descent proved to follow Mendelian rules was that of a serious malformation of the hand studied by Farabee in America. Drinkwater subsequently worked out pedigrees for the same malformation in England. After many attempts, he now tells me that he has succeeded in proving that the American family and one of his own had an abnormal ancestor in common, five generations ago.

significance of heredity was frequently denied, and resemblances to parents or ancestors were looked on as interesting curiosities. Inveighing against hereditary political institutions, Tom Paine remarks that the idea is as absurd as that of an "hereditary wise man," or an "hereditary mathematician," and to this day I suppose many people are not aware that he is saying anything more than commonly foolish. We, on the contrary, would feel it something of a puzzle if two parents, both mathematically gifted, had any children *not* mathematicians. Galton first demonstrated the overwhelming importance of these considerations, and had he not been misled, partly by the theory of pangenesis, but more by his mathematical instincts and training, which prompted him to apply statistical treatment rather than qualitative analysis, he might, not improbably, have discovered the essential facts of Mendelism.

It happens rarely that science has anything to offer to the common stock of ideas at once so comprehensive and so simple that the courses of our thoughts are changed. Contributions to the material progress of mankind are comparatively frequent. They result at once in application. Transit is quickened; communication is made easier; the food-supply is increased and population multiplied. By direct application to the breeding of animals and plants such results must even flow from Mendel's work. But I imagine the greatest practical change likely to ensue from modern genetic discovery will be a quickening of interest in the true nature of man and in the biology of races. I have spoken cautiously as to the evidence for the operation of any simple Mendelian system in the descent of human faculty; yet the certainty that systems which differ from the simpler schemes only in degree of complexity are at work in the distribution of characters among the human population cannot fail to influence our conceptions of life and of ethics, leading perhaps ultimately to modification of social usage. That change cannot but be in the main one of simplification. The eighteenth century made great pretence of a return to nature, but it did not occur to those philosophers first to enquire what nature is; and perhaps not even the patristic writings contain fantasies much further from physiological truth than those which the rationalists of the 'Encyclopædia' adopted as the basis of their social schemes. For men are so far from being born equal or similar that to the naturalist they stand as the very type of a polymorphic species. Even most of our local 'races' consist of many distinct strains and individual types. From the population of any ordinary English town as many distinct human breeds could in a few generations be isolated as there are now breeds of dogs, and indeed such a population in its present state is much what the dogs of Europe would be in ten years' time but for the interference of the fanciers. Even as at present constituted, owing to the isolating effects of instinct, fashion, occupation, and social class, many incipient strains already exist.

In one respect civilized man differs from all other species of animal or plant in that, having prodigious and ever-increasing power over nature, he invokes these powers for the preservation and main-

tenance of many of the inferior and all the defective members of his species. The inferior freely multiply, and the defective, if their defects be not so grave as to lead to their detention in prisons or asylums, multiply also without restraint. Heredity being strict in its action, the consequences are in civilized countries much what they would be in the kennels of the dog-breeder who continued to preserve all his puppies, good and bad: the proportion of defectives increases. The increase is so considerable that outside every great city there is a smaller town inhabited by defectives and those who wait on them. Round London we have a ring of such towns with some 30,000 inhabitants, of whom about 28,000 are defective, largely, though of course by no means entirely, bred from previous generations of defectives. Now, it is not for us to consider practical measures. As men of science we observe natural events and deduce conclusions from them. I may perhaps be allowed to say that the remedies proposed in America, in so far as they aim at the eugenic regulation of marriage on a comprehensive scale, strike me as devised without regard to the needs either of individuals or of a modern State. Undoubtedly if they decide to breed their population of one uniform puritan grey, they can do it in a few generations; but I doubt if timid respectability will make a nation happy, and I am sure that qualities of a different sort are needed if it is to compete with more vigorous and more varied communities. Everyone must have a preliminary sympathy with the aims of eugenists both abroad and at home. Their efforts at the least are doing something to discover and spread truth as to the physiological structure of society. The spirit of such organizations, however, almost of necessity suffers from a bias towards the accepted and the ordinary, and if they had power it would go hard with many ingredients of Society that could be ill-spared. I notice an ominous passage in which even Galton, the founder of eugenics, feeling perhaps some twinge of his Quaker ancestry, remarks that "as the Bohemianism in the nature of our race is destined to perish, the sooner it goes, the happier for mankind." It is not the eugenists who will give us what Plato has called divine releases from the common ways. If some fancier with the catholicity of Shakespeare would take us in hand, well and good; but I would not trust even Shakespeares meeting as a committee. Let us remember that Beethoven's father was an habitual drunkard and that his mother died of consumption. From the genealogy of the patriarchs also we learn—what may very well be the truth—that the fathers of such as dwell in tents, and of all such as handle the harp or organ, and the instructor of every artificer in brass and iron—the founders, that is to say, of the arts and the sciences—came in direct descent from Cain, and not in the posterity of the irreproachable Seth, who is to us, as he probably was also in the narrow circle of his own contemporaries, what naturalists call a *nomen nudum*.

Genetic research will make it possible for a nation to elect by what sort of beings it will be represented not very many generations hence, much as a farmer can decide whether his byres shall be full of shorthorns or Herefords. It will be very surprising indeed if

some nation does not make trial of this new power. They may make awful mistakes, but I think they will try.

Whether we like it or not, extraordinary and far-reaching changes in public opinion are coming to pass. Man is just beginning to know himself for what he is—a rather long-lived animal, with great powers of enjoyment if he does not deliberately forgo them. Hitherto superstition and mythical ideas of sin have predominantly controlled these powers. Mysticism will not die out; for those strange fancies knowledge is no cure; but their forms may change, and mysticism as a force for the suppression of joy is happily losing its hold on the modern world. As in the decay of earlier religions Ushabti dolls were substituted for human victims, so telepathy, necromancy, and other harmless toys take the place of eschatology and the inculcation of a ferocious moral code. Among the civilized races of Europe we are witnessing an emancipation from traditional control in thought, in art, and in conduct which is likely to have prolonged and wonderful influences. Returning to freer or, if you will, simpler conceptions of life and death, the coming generations are determined to get more out of this world than their forefathers did. Is it then to be supposed that when science puts into their hand means for the alleviation of suffering immeasurable, and for making this world a happier place, that they will demur to using those powers? The intenser struggle between communities is only now beginning, and with the approaching exhaustion of that capital of energy stored in the earth before man began it must soon become still more fierce. In England some of our great-grandchildren will see the end of the easily accessible coal, and, failing some miraculous discovery of available energy, a wholesale reduction in population. There are races who have shown themselves able at a word to throw off all tradition and take into their service every power that science has yet offered them. Can we expect that they, when they see how to rid themselves of the ever-increasing weight of a defective population, will hesitate? The time cannot be far distant when both individuals and communities will begin to think in terms of biological fact, and it behoves those who lead scientific thought carefully to consider whither action should lead. At present I ask you merely to observe the facts. The powers of science to preserve the defective are now enormous. Every year these powers increase. This course of action must reach a limit. To the deliberate intervention of civilization for the preservation of inferior strains there must sooner or later come an end, and before long nations will realize the responsibility they have assumed in multiplying these "cankers of a calm world and a long peace."

The definitely feeble-minded we may with propriety restrain, as we are beginning to do even in England, and we may safely prevent unions in which both parties are defective, for the evidence shows that as a rule such marriages, though often prolific, commonly produce no normal children at all. The union of such social vermin we should no more permit than we would allow parasites to breed on our own bodies. Further than that in restraint of marriage we ought not to go, at least not yet. Something too may be done by a reform

of medical ethics. Medical students are taught that it is their duty to prolong life at whatever cost in suffering. This may have been right when diagnosis was uncertain and interference usually of small effect; but deliberately to interfere now for the preservation of an infant so gravely diseased that it can never be happy or come to any good is very like wanton cruelty. In private few men defend such interference. Most who have seen these cases lingering on agree that the system is deplorable, but ask where can any line be drawn. The biologist would reply that in all ages such decisions have been made by civilised communities with fair success both in regard to crime and in the closely analogous case of lunacy. The real reason why these things are done is because the world collectively cherishes occult views of the nature of life, because the facts are realised by few, and because between the legal mind—to which society has become accustomed to defer—and the seeing eye, there is such physiological antithesis that hardly can they be combined in the same body. So soon as scientific knowledge becomes common property, views more reasonable and, I may add, more humane, are likely to prevail.

To all these great biological problems that modern society must sooner or later face there are many aspects besides the obvious ones. Infant mortality we are asked to lament without the slightest thought of what the world would be like if the majority of these infants were to survive. The decline in the birth-rate in countries already overpopulated is often deplored, and we are told that a nation in which population is not rapidly increasing must be in a decline. The slightest acquaintance with biology, or even school-boy natural history, shows that this inference may be entirely wrong, and that before such a question can be decided in one way or the other, hosts of considerations must be taken into account. In normal stable conditions population is stationary. The laity never appreciates, what is so clear to a biologist, that the last century and a quarter, corresponding with the great rise in population, has been an altogether exceptional period. To our species this period has been what its early years in Australia were to the rabbit. The exploitation of energy-capital of the earth in coal, development of the new countries, and the consequent pouring of food into Europe, the application of antiseptics, these are the things that have enabled the human population to increase. I do not doubt that if population were more evenly spread over the earth it might increase very much more; but the essential fact is that under any stable conditions a limit must be reached. A pair of wrens will bring off a dozen young every year, but each year you will find the same number of pairs in your garden. In England the limit beyond which under present conditions of distribution increase of population is a source of suffering rather than of happiness has been reached already. Younger communities living in territories largely vacant are very probably right in desiring and encouraging more population. Increase may, for some temporary reason, be essential to their prosperity. But those who live, as I do, among thousands of creatures in a state of semi-starvation will realise that too few is better than too many,

and will acknowledge the wisdom of Ecclesiasticus who said, "Desire not a multitude of unprofitable children."

But at least it is often urged that the decline in the birth-rate of the intelligent and successful sections of the population—I am speaking of the older communities—is to be regretted. Even this cannot be granted without qualification. As the biologist knows, differentiation is indispensable to progress. If population were homogeneous, civilisation would stop. In every army the officers must be comparatively few. Consequently, if the upper strata of the community produce more children than will recruit their numbers some must fall into the lower strata and increase the pressure there. Statisticians tell us that an average of four children under present conditions is sufficient to keep the number constant, and as the expectation of life is steadily improving we may perhaps contemplate some diminution of that number without alarm.

In the study of history biological treatment is only beginning to be applied. For us the causes of the success and failure of races are physiological events, and the progress of man has depended upon a chain of these events, like those which have resulted in the "improvement" of the domesticated animals and plants. It is obvious, for example, that had the cereals never been domesticated cities could scarcely have existed. But we may go further, and say that in temperate countries of the Old World (having neither rice nor maize) populations concentrated in large cities have been made possible by the appearance of a "thrashable" wheat. The ears of the wild wheats break easily to pieces, and the grain remains in the thick husk. Such wheat can be used for food, but not readily. Ages before written history began, in some unknown place, plants, or more likely a plant, of wheat lost the dominant factor to which this brittleness is due, and the recessive, thrashable wheat resulted. Some man noticed this wonderful novelty, and it has been disseminated over the earth. The original variation may well have occurred once only, in a single germ-cell.

So must it have been with Man. Translated into terms of factors, how has that progress in control of nature which we call civilization been achieved? By the sporadic appearance of variations, mostly, perhaps all, consisting in a loss of elements, which inhibit the free working of the mind. The members of civilized communities, when they think about such things at all, imagine the process a gradual one, and that they themselves are active agents in it. Few, however, contribute anything but their labour; and except in so far as they have freedom to adopt and imitate, their physiological composition is that of an earlier order of beings. Annul the work of a few hundreds—I might say scores—of men, and on what plane of civilisation should we be? We should not have advanced beyond the mediæval stage without printing, chemistry, steam, electricity, or surgery worthy the name. These things are the contributions of a few excessively rare minds. Galton reckoned those to whom the term "illustrious" might be applied as one in a million, but in that number he is, of course, reckoning men famous in ways which add

nothing to universal progress. To improve by subordinate invention, to discover details missed, even to apply knowledge never before applied, all these things need genius in some degree, and are far beyond the powers of the average man of our race; but the true pioneer, the man whose penetration creates a new world, as did that of Newton and of Pasteur, is inconceivably rare. But for a few thousands of such men, we should perhaps be in the Palæolithic era, knowing neither metals, writing, arithmetic, weaving, nor pottery.

In the history of Art the same is true, but with this remarkable difference, that not only are gifts of artistic creation very rare, but even the faculty of artistic enjoyment, not to speak of higher powers of appreciation, is not attained without variation from the common type. I am speaking, of course, of the non-Semitic races of modern Europe, among whom the power whether of making or enjoying works of art is confined to an insignificant number of individuals. Appreciation can in some degree be simulated, but in our population there is no widespread physiological appetite for such things. When detached from the centres where they are made by others most of us pass our time in great contentment, making nothing that is beautiful, and quite unconscious of any deprivation. Musical taste is the most notable exception, for in certain races—for example, the Welsh and some of the Germans—it is almost universal. Otherwise artistic faculty is still sporadic in its occurrence. The case of music well illustrates the application of genetic analysis to human faculty. No one disputes that musical ability is congenital. In its fuller manifestation it demands sense of rhythm, ear, and special nervous and muscular powers. Each of these is separable and doubtless genetically distinct. Each is the consequence of a special departure from the common type. Teaching and external influences are powerless to evoke these faculties, though their development may be assisted. The only conceivable way in which the people of England, for example, could become a musical nation would be by the gradual rise in the proportional numbers of a musical strain or strains until the present type became so rare as to be negligible. It by no means follows that in any other respect the resulting population would be distinguishable from the present one. Difficulties of this kind beset the efforts of anthropologists to trace racial origins. It must continually be remembered that most characters are independently transmitted and capable of such recombination. In the light of Mendelian knowledge the discussion whether a race is pure or mixed loses almost all significance. A race is pure if it breeds pure and not otherwise. Historically we may know that a race like our own was, as a matter of fact, of mixed origin. But a character may have been introduced by a single individual, though subsequently it becomes common to the race. This is merely a variant on the familiar paradox that in the course of time if registration is accurate we shall all have the same surname. In the case of music, for instance, the gift, originally perhaps from a Welsh source, might permeate the nation, and the question would then arise whether the nation, so changed, was the English nation or not.

(To be continued.)

NOTES AND QUERIES.

REPTILIA.

Enemies of Young Grass Snakes.—On August 15th, when entering a conservatory where I keep a number of reptiles and amphibians, I discovered a large female Toad (*Bufo vulgaris*) engaged in swallowing a young Grass Snake (*Tropidonotus natrix*). The Snake had coiled its tail round the left fore limb of the Toad, which gave the latter some little difficulty to overcome, but in about three minutes the last twitching bit of Snake's tail had disappeared. The Snake had emerged from one of two clutches (together making sixty eggs) which I had placed in a bed of dry moss and decaying vegetable matter on the floor a fortnight before. Though the conservatory is not artificially heated, and the spot where the eggs were placed gets no sun, these Snakes emerged more than a fortnight before the usual time. To return to the Toad, it was at 9.30 a.m. that I interrupted its meal, and I immediately removed the remaining eggs to a vivarium for safety; noticing that several eggs had hatched but the Snakes were not to be seen. At 3 p.m. I chloroformed the Toad, and the following week dissected it, when, to my surprise, I found no fewer than four young Snakes in the stomach and the tail of a fifth protruding from the intestine. The Snakes in the stomach were coiled and packed in a most wonderful manner, and the stomach appeared to be distended to its utmost, and was forced well to the left side of the body. The Snakes were from seven to seven and a half inches in length, giving a total length of three feet, nearly as thick as an ordinary pencil. None of the Snakes in the stomach or the visible tail of the fifth showed any signs of digestion, so I think it only reasonable to assume that the Snake in the intestine was the first swallowed, and, having room, sought to escape from its tomb by forcing its way through the pyloric valve into the duodenum. Data as to the enemies of young Snakes are badly needed. For some time past I have been trying to ascertain what becomes of the vast numbers of young Snakes that are hatched every year. Eggs are common enough, yet young

Snakes are rarely seen, adults or half-grown specimens being comparatively scarce.

On November 1st and 15th of last year I collected just over 550 egg-shells (*T. natrix*) from one manure-heap at Hensot. At least 500 of these had produced Snakes, yet there were only three young Snakes, and one Toad in the heap. What had become of the 500? (I refrain from suggesting the solitary Toad had accommodated them.) Not one was observed on the surrounding hedge-banks during the following spring or summer. Climate and animal enemies must have accounted for the majority—birds are no doubt largely responsible. If any of your readers have any notes on the enemies of young Snakes or Adders I should be glad to hear of them.—ARTHUR LOVERIDGE (Kiltiernan, Llandaff).

PISCES.

Notes by an Angler.*—BREAM.—Two species of this fish are found in the Mole—the White Bream (*Blicca bjoernka* †) and the Common or Carp Bream (*Abramis brama*). Some local anglers aver that there are three kinds of this fish to be found, and instance what they call the Golden Bream, a variety of *A. brama*. The white or silvery species is found in the shallower waters, in the deeper holes *A. brama* is dominant. Large shoals of the latter species are to be seen on fine summer days swimming at or near the surface, but always near or above the deeper holes or water they frequent. I have seen them on some few occasions thus patrol their haunts from 10 a.m. to 6 p.m., but this is unusual and their time for this appearance is, as a rule, from about midday to near 4 p.m. As they sail about in battalions (not aimlessly but above their haunts) their ranks are frequently joined by a large Roach, much larger than I ever hooked, who keeps in the ranks and accompanies the Bream patrol. At times a great splash is heard, as a whole cohort suddenly dives, their greatest fright, so far as I have observed and apart from a man on the bank, being the flight over them of some large bird—that of a water-hen is sufficient to cause a stampede. When

* Continued from p. 320.

† In the sixties of last century, when angling was pursued in the timber basins of the Surrey Commercial Docks at Rotherhithe, this fish was abundant in those resorts as I well remember, and also in the old Surrey Canal, which then ran through flourishing market gardens, the entomological features of which were well known to the late Edward Newman, who founded this Journal. These regions are now commercial wastes.

swimming near the surface only the black backs and paler snouts of the Bream are seen and the great depth of body is not appreciated.

THE COMMON CARP (*Cyprinus carpio*).—This fish is at least not plentiful in the parts of the Mole which I frequent. I have never seen a specimen at Dorking, though John Timb, who wrote in 1822, refers to the 'Red Lion Inn' in the High Street of that town as "a noted house for Water-soncey, Carp, and Perch, which were here served up in great perfection during the season."* On June 17th, 1912, I captured my only Carp from the Mole at Gatwick, in moderately shallow water, and where the stream is little wider than a brook; other fish were not feeding. The same circumstances were reported elsewhere:—"June 16th was remarkable for some curious angling happenings. For instance, although a heavy thunderstorm threatened for most of the day, Carp were feeding well in the hard-fished Hampstead Ponds, and many a youthful Waltonian there caught the fish of his life up to that time."† Similar reports were received from other parts of the country on those days, a curious and unexplained episode in the habits of this fish.—W. L. DISTANT.

* 'A Picturesque Promenade round Dorking, in Surrey,' p. 77.

† 'The Fishing Gazette,' July 6th, 1912.

